

Research Article

Calcium Metabolism Indicators in Patients with Generalized Periodontitis and Hypertension

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Abstract

The objective of the study is to determine the level of calcium in patients with hypertension of the II degree and generalized periodontitis of the II degree.

There were examined 30 patients with hypertension of the II degree with generalized periodontitis of the II degree. Patients' age ranged from 35 to 54 years. These patients were in the main group. Treatment of patients included taking the medicine "Ca-D₃ NIKOMED".

The control group included 10 patients without general somatic pathology and with healthy periodontitis of the same age. The results obtained were subject to variational and statistical processing.

The analyses were carried out before and 3 months after the treatment. The level of general Ca in patients with generalized periodontitis of the II degree and hypertension of the II degree before the treatment was 1.66 ± 0.03 mmol/l ($p < 0.001$) (norm 2.15-2.5 mmol/l). In the patients of control group this figure was 2.33 ± 0.04 mmol/l ($p < 0.001$).

After 3 months the level of general Ca in patients with generalized periodontitis of the II degree and hypertension of the II degree was 1.87 ± 0.03 mmol/l ($p < 0.001$).

The level of ionized Ca in patients with generalized periodontitis of the II degree and hypertension of the II degree before the treatment was 0.36 ± 0.01 mmol/l ($p < 0.001$); after the treatment the level of ionized Ca was 0.41 ± 0.01 mmol/l ($p < 0.001$).

The level of ionized Ca in control group patients was 1.03 ± 0.02 mmol/l ($p < 0.001$).

We can conclude: according to the analysis of levels of general and ionized calcium in serum of patients with generalized periodontitis of the II degree and hypertension of the II degree we can conclude that these indexes are lower than normal; patients with generalized periodontitis of the II degree and hypertension of the II degree have increased levels of general calcium and ionized calcium in serum after taking the drug "Ca-D₃ NIKOMED" during 3 months.

Keywords

hypertension; generalized periodontitis; Ca

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Problem statement and analysis of the recent research

Calcium - is a unique element, which plays an important role in a human life [6, 11]. Calcium and its compounds play an important role in contracting skeletal and cardiac muscles, intracellular secretion, mediator excitation in synapses, the generation of potentials in some activate structures, maintaining the necessary balance between activation and inhibition in the cerebral cortex, affecting peroxide lipid oxidation, transportation of ions through a cell membrane, activity of various groups of enzymes, humoral and cellular immunity, hemodynamics and microcirculation, aggregate state of blood, glycogenolysis and glucone genesis, hormonal secretion, iodine exchange, growth and bone formation, mineralization of bone tissue, functioning of the hypothalamic-pituitary system, etc. [2, 3, 5, 9, 12, 14].

About 99% of calcium is found in bone and cartilage tissues in the form of hydroxyapatite crystals (the main depot of Ca in the organism), the rest - in soft tissues and extracel-

lular fluid [1, 15, 16, 17]. Concentration of calcium ions in blood serum is one of the most important constants of homeostasis. 50% of calcium is represented in an ionized form in blood serum and extracellular fluid (biologically active fraction); 40% - is in a protein-bound state, mainly with albumins (biologically inert calcium) [10, 13, 14, 15].

The exchange of phosphorus is closely connected with the exchange of calcium [3, 7, 11]. Bone tissue contains 80% of the total amount of phosphorus (in the form of crystals of hydroxyapatite). Adequate concentration of phosphorus in blood is the necessary condition for normal mineralization [2, 6, 9, 11, 12, 13].

It is known that calcium and phosphorus take part in the metabolism of bone tissue, which, in turn, plays an important role in the maintenance of constant concentration of these elements in blood. Bones contain 89% of the total calcium of the body, 87% of phosphorus, 58% of magnesium, a large amount of potassium and sodium, and other elements [16, 18].

Bone tissue - is a dynamic, metabolically active system, which consists of organic and inorganic components [4, 8].

The organic part of the bone (osteoid) is represented by a collagen matrix and non-collagen proteins. The inorganic component is represented by hydroxyapatite, which initially deposits on the organic matrix as a salt of calcium hydroxyphosphate and then becomes an apatite crystal. About 60% of the mineral component of the bone may be amorphous calcium phosphate, which is a mobile reserve of calcium and phosphorus, acts as an exchange part and ensures the needs of the whole organism.

The cellular composition of the bone is represented by osteoblasts, osteocytes and osteoclasts. The main function of osteoclasts is the resorption of bone matrix [8, 18]. It has been proved, that the activation of osteoclasts is influenced by FNP- α , IL-1, IL-6. Basic functions of osteoblasts are: synthesis of collagen and the formation of its fibers, synthesis of non-collagen proteins, synthesis of enzymes (alkaline phosphatase, collagenase, plasminogen activator), participation in the transport of calcium and phosphate in the bone matrix and the development of hydroxyapatite crystals. In the further development osteoblasts are transformed into osteocytes - the most numerous bone marrow cells that are included into the intercellular matrix and support the structure of bone tissue. Osteocytes perform the following functions: stimulate the synthesis of collagen and glycosaminoglycans, participate in metabolism (protein, water, mineral) of bone tissue and the formation of a new bone.

The structural integrity of the skeleton is supported by a continuous process of bone remodeling. Bone remodeling begins in the womb and lasts during the whole life [16].

Remodeling of bone tissue plays a key role in bone homeostasis and metabolic processes in the body. It is a permanent physiological process, the main function of which is the renovation of bone structures, adaptation to mechanical stresses, and the maintenance of mineral metabolism of calcium and phosphorus [7]. The process of remodeling is controlled by hormones, a number of local biologically active substances (polypeptide growth factors and cytokines).

A sufficient amount of calcium is required for bone tissue mineralization (reminerization) in the areas of bone resorption. Bone tissue is a depot of calcium and, at the same time, calcium determines the strength of the bones, performing a structural function. After the age of 40 years the process of bone resorption prevails over bone formation, which leads to a gradual decrease in the mass and strength of the bone.

The objective of the study. The objective of the study is to determine the level of calcium in patients with hypertension of the II degree and generalized periodontitis of the II degree.

1. Materials and methods of the research

There were examined 30 patients with hypertension of the II degree and with generalized periodontitis of the II degree. Patients' age ranged from 35 to 54 years. These patients were included into the main group. The control group included 10 patients without general somatic pathology and and the healthy periodontium of the same age. The diagnosis

of periodontal diseases was made according to the anamnesis, clinical dental examination and generally accepted additional methods of examination. The classification according to M.F. Danilevsky (1994) was used during diagnostics of the diseases of periodontium.

Treatment of patients included the medicine "Ca-D₃ NIKOMED": patients took 2 tablets a day (in the morning and evening). Blood collection was performed before the beginning of treatment and after 3 months of treatment.

The principle of the method for calcium content determining in the blood serum is that Ca ions in the alkaline medium react with o-cresol phthalein complexon and form a coloured complex. The intensity of the staining of the purple colour complex is proportional to the concentration of calcium in the experimental sample.

The obtained results were subjected to variation-statistical analysis using statistical package "Stat Soft 6.0"; classical methods of variation statistics using mean ranges and assessment of their authenticity.

2. Results of the research and their discussion

The analyses were performed before and 3 months after the treatment. The level of general Ca in patients with generalized periodontitis of the II degree and hypertension of the II degree before the treatment was 1.66 ± 0.03 mmol/l ($p < 0.001$) (norm 2.15-2.5 mmol/l). In the control group patients this figure was 2.33 ± 0.04 mmol/l ($p < 0.001$).

After 3 months of the treatment the level of general Ca in patients with generalized periodontitis of the II degree and hypertension of the II degree was 1.87 ± 0.03 mmol/l ($p < 0.001$).

The level of ionized Ca in patients with generalized periodontitis of the II degree and hypertension of the II degree before the treatment was 0.36 ± 0.01 mmol/l ($p < 0.001$); after the treatment the level of ionized Ca was 0.41 ± 0.01 mmol/l ($p < 0.001$). The level of ionized Ca in control group patients was 1.03 ± 0.02 mmol/l ($p < 0.001$).

Taking Ca has a positive effect on the treatment, although after the administration of the medicine within 3 months, the optimal level of calcium in the blood serum has not been achieved. Increased levels of general and ionized calcium have been noted.

3. Conclusions

1. According to the analysis of levels of general and ionized calcium in blood serum in patients with generalized periodontitis of the II degree and hypertension of the II degree we can conclude that these indices are lower than the normal ones.
2. After taking the medicine "Ca-D₃ NIKOMED" during 3 months there are increased indices of general and ionized Ca in blood serum in patients with generalized

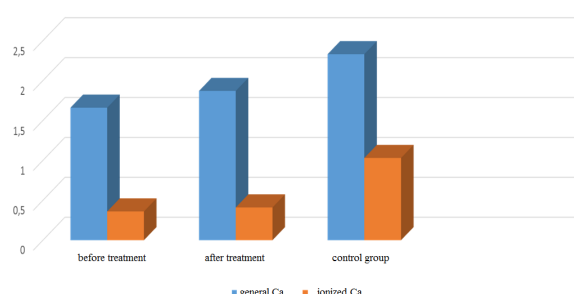


Figure 1. Indicators of calcium metabolism in patients with generalized periodontitis and hypertension

Note. Probability of differences between control and main groups, $p < 0.001$.

periodontitis of the II degree and hypertension of the II degree.

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